[74 FR 56374, Oct. 30, 2009, as amended at 75 FR 66474, Oct. 28, 2010]

Subpart II—Industrial Wastewater Treatment

SOURCE: 75 FR 39767, July 12, 2010, unless otherwise noted.

§ 98.350 Definition of source category.

(a) This source category consists of anaerobic processes used to treat industrial wastewater and industrial wastewater treatment sludge at facilities that perform the operations listed in this paragraph.

(1) Pulp and paper manufacturing.

(2) Food processing.

(3) Ethanol production.

(4) Petroleum refining.

(b) An *anaerobic process* is a procedure in which organic matter in wastewater, wastewater treatment sludge, or other material is degraded by micro organisms in the absence of oxygen, resulting in the generation of CO_2 and CH_4. This source category consists of the following: anaerobic reactors, anaerobic lagoons, anaerobic sludge digesters, and biogas destruction devices (for example, burners, boilers, turbines, flares, or other devices).

(1) An *anaerobic reactor* is an enclosed vessel used for anaerobic wastewater treatment (*e.g.*, upflow anaerobic sludge blanket, fixed film).

(2) An *anaerobic sludge digester* is an enclosed vessel in which wastewater treatment sludge is degraded anaerobically.

(3) An *anaerobic lagoon* is a lined or unlined earthen basin used for wastewater treatment, in which oxygen is absent throughout the depth of the basin, except for a shallow surface zone. Anaerobic lagoons are not equipped with surface aerators. Anaerobic lagoons are classified as deep (depth more than 2 meters) or shallow (depth less than 2 meters).

(c) This source category does not include municipal wastewater treatment plants or separate treatment of sanitary wastewater at industrial sites.

§ 98.351 Reporting threshold.

You must report GHG emissions under this subpart if your facility meets all of the conditions under paragraphs (a) or (b) of this section:

(a) *Petroleum refineries and pulp and paper manufacturing.*

(1) The facility is subject to reporting under subpart Y of this part (Petroleum Refineries) or subpart AA of this part (Pulp and Paper Manufacturing).

(2) The facility meets the requirements of either § 98.2(a)(1) or (2).

(3) The facility operates an anaerobic process to treat industrial wastewater and/or industrial wastewater treatment sludge.

(b) *Ethanol production and food processing facilities.*

(1) The facility performs an ethanol production or food processing operation, as defined in § 98.358 of this subpart.

(2) The facility meets the requirements of § 98.2(a)(2).

(3) The facility operates an anaerobic process to treat industrial wastewater and/or industrial wastewater treatment sludge.

§ 98.352 GHGs to report.

(a) You must report CH_4 generation, CH_4 emissions, and CH_4 recovered from treatment of industrial wastewater at each anaerobic lagoon and anaerobic reactor.

(b) You must report CH_4 emissions and CH_4 recovered from each anaerobic sludge digester.

(c) You must report CH_4 emissions and CH_4 destruction resulting from each biogas collection and biogas destruction device.

(d) You must report under subpart C of this part (General Stationary Fuel Combustion Sources) the emissions of CO_2, CH_4, and N_2O from each stationary combustion unit associated with the landfill gas destruction device, if present, by following the requirements of subpart C of this part.

§ 98.353 Calculating GHG emissions.

(a) For each anaerobic reactor and anaerobic lagoon, estimate the annual mass of CH_4 generated according to the applicable requirements in paragraphs (a)(1) through (a)(2) of this section.

(1) If you measure the concentration of organic material entering the anaerobic reactors or anaerobic lagoon using methods for the determination of

chemical oxygen demand (COD), then estimate annual mass of CH_4 generated using Equation II–1 of this section.

$$CH_4G_n = \sum_{w=1}^{52}\left[Flow_w * COD_w * B_o * MCF * 0.001\right] \qquad \text{(Eq. II-1)}$$

Where:

CH_4G_n = Annual mass CH_4 generated from the nth anaerobic wastewater treatment process (metric tons).

n = Index for processes at the facility, used in Equation II–7.

w = Index for weekly measurement period.

$Flow_w$ = Volume of wastewater sent to an anaerobic wastewater treatment process in week w (m^3/week), measured as specified in §98.354(d).

COD_w = Average weekly concentration of chemical oxygen demand of wastewater entering an anaerobic wastewater treatment process (for week w)(kg/m^3), measured as specified in §98.354(b) and (c).

B_0 = Maximum CH_4 producing potential of wastewater (kg CH_4/kg COD), use the value 0.25.

MCF = CH_4 conversion factor, based on relevant values in Table II–1 of this subpart.

0.001 = Conversion factor from kg to metric tons.

(2) If you measure the concentration of organic material entering the anaerobic reactors or anaerobic lagoon using methods for the determination of 5-day biochemical oxygen demand (BOD_5), then estimate annual mass of CH_4 generated using Equation II–2 of this section.

$$CH_4G_n = \sum_{w=1}^{52}\left[Flow_w * BOD_{5,w} * B_o * MCF * 0.001\right] \qquad \text{(Eq. II-2)}$$

Where:

CH_4G_n = Annual mass of CH_4 generated from the anaerobic wastewater treatment process (metric tons).

n = Index for processes at the facility, used in Equation II–7.

w = Index for weekly measurement period.

$Flow_w$ = Volume of wastewater sent to an anaerobic wastewater treatment process in week w(m^3/week), measured as specified in §98.354(d).

$BOD_{5,w}$ = Average weekly concentration of 5-day biochemical oxygen demand of wastewater entering an anaerobic wastewater treatment process for week w(kg/m^3), measured as specified in §98.354(b) and (c).

B_0 = Maximum CH_4 producing potential of wastewater (kg CH_4/kg BOD_5), use the value 0.6.

MCF = CH_4 conversion factor, based on relevant values in Table II–1 of this subpart.

0.001 = Conversion factor from kg to metric tons.

(b) For each anaerobic reactor and anaerobic lagoon from which biogas is not recovered, estimate annual CH_4 emissions using Equation II–3 of this section.

$$CH_4E_n = CH_4G_n \qquad \text{(Eq. II-3)}$$

Where:

CH_4E_n = Annual mass of CH_4 emissions from the wastewater treatment process n from which biogas is not recovered (metric tons).

CH_4G_n = Annual mass of CH_4 generated from the wastewater treatment process n, as calculated in Equation II–1 or II–2 of this section (metric tons).

(c) For each anaerobic digester, anaerobic reactor, or anaerobic lagoon from which some biogas is recovered, estimate the annual mass of CH_4 recovered according to the requirements in paragraphs (c)(1) and (c)(2) of this section. To estimate the annual mass of CH_4 recovered, you must continuously monitor gas flow rate as specified in §98.354(f) and (h).

(1) If you continuously monitor CH_4 concentration (and if necessary, temperature, pressure, and moisture content required as specified in §98.354(f))

of the biogas that is collected and routed to a destruction device using a monitoring meter specifically for CH_4 gas, as specified in §98.354(g), you must use this monitoring system and calculate the quantity of CH_4 recovered for destruction using Equation II–4 of this section. A fully integrated system that directly reports CH_4 content requires only the summing of results of all monitoring periods for a given year.

$$R_n = \sum_{m=1}^{M}\left[(V)_m * (K_{MC})_m * \frac{(C_{CH4})_m}{100\%} * 0.0423 * \frac{520^{o}R}{(T)_m} * \frac{(P)_m}{1\ atm} * \frac{0.454}{1{,}000}\right] \quad \text{(Eq. II-4)}$$

Where:

R_n = Annual quantity of CH_4 recovered from the nth anaerobic reactor, digester, or lagoon (metric tons CH_4/yr)

n = Index for processes at the facility, used in Equation II–7.

M = Total number of measurement periods in a year. Use M = 365 (M = 366 for leap years) for daily averaging of continuous monitoring, as provided in paragraph (c)(1)of this section. Use M = 52 for weekly sampling, as provided in paragraph (c)(2)of this section.

m = Index for measurement period.

V_m = Cumulative volumetric flow for the measurement period in actual cubic feet (acf). If no biogas was recovered during a monitoring period, use zero.

$(K_{MC})_m$ = Moisture correction term for the measurement period, volumetric basis.

= 1 when $(V)_m$ and $(C_{CH4})_m$ are measured on a dry basis or if both are measured on a wet basis.

= $1-(f_{H2O})_m$ when $(V)_m$ is measured on a wet basis and $(C_{CH4})_m$ is measured on a dry basis.

= $1/[1-(f_{H2O})_m]$ when $(V)_m$ is measured on a dry basis and $(C_{CH4})_m$ is measured on a wet basis.

$(f_{H2O})_m$ = Average moisture content of biogas during the measurment period, volumetric basis, (cubic feet water per cubic feet biogas).

$(C_{CH4})_m$ = Average CH_4 concentration of biogas during the measurement period, (volume %).

0.0423 = Density of CH_4 lb/cf at 520 °R or 60 °F and 1 atm.

520 °R = 520 degrees Rankine.

T_m = Temperature at which flow is measured for the measurement period (°R). If the flow rate meter automatically corrects for temperature replace ''520 °R/T_m'' with ''1''.

P_m = Pressure at which flow is measured for the measurement period (atm). If the flow rate meter automatically corrects for pressure, replace ''P_m/1'' with ''1''.

0.454/1,000 = Conversion factor (metric ton/lb).

(2) If you do not continuously monitor CH_4 concentration according to paragraph (c)(1) of this section, you must determine the CH_4 concentration, temperature, pressure, and, if necessary, moisture content of the biogas that is collected and routed to a destruction device according to the requirements in paragraphs (c)(2)(i) through (c)(2)(iii) of this section and calculate the quantity of CH_4 recovered for destruction using Equation II–4 of this section.

(i) Continuously monitor gas flow rate and determine the volume of biogas each week and the cumulative volume of biogas each year that is collected and routed to a destruction device. If the gas flow meter is not equipped with automatic correction for temperature, pressure, or, if necessary, moisture content, you must determine these parameters as specified in paragraph (c)(2)(iii) of this section.

(ii) Determine the CH_4 concentration in the biogas that is collected and routed to a destruction device in a location near or representative of the location of the gas flow meter once each calendar week, with at least three days between measurements. For a given calendar week, you are not required to determine CH_4 concentration if the cumulative volume of biogas for that calendar week, determined as specified in paragraph (c)(2)(i) of this section, is zero.

(iii) If the gas flow meter is not equipped with automatic correction for temperature, pressure, or, if necessary, moisture content:

(A) Determine the temperature and pressure in the biogas that is collected and routed to a destruction device in a location near or representative of the

location of the gas flow meter once each calendar week, with at least three days between measurements.

(B) If the CH_4 concentration is determined on a dry basis and biogas flow is determined on a wet basis, or CH_4 concentration is determined on a wet basis and biogas flow is determined on a dry basis, and the flow meter does not automatically correct for moisture content, determine the moisture content in the biogas that is collected and routed to a destruction device in a location near or representative of the location of the gas flow meter once each calendar week that the cumulative biogas flow measured as specified in §98.354(h) is greater than zero, with at least three days between measurements.

(d) For each anaerobic digester, anaerobic reactor, or anaerobic lagoon from which some quantity of biogas is recovered, you must estimate both the annual mass of CH_4 that is generated, but not recovered, according to paragraph (d)(1) of this section and the annual mass of CH_4 emitted according to paragraph (d)(2) of this section.

(1) Estimate the annual mass of CH_4 that is generated, but not recovered, using Equation II–5 of this section.

$$CH_4L_n = R_n * \left(\frac{1}{\mathrm{CE}} - 1\right) \qquad \text{(Eq. II-5)}$$

Where:

CH_4L_n = Leakage at the anaerobic process n (metric tons CH_4).

n = Index for processes at the facility, used in Equation II–7.

R_n = Annual quantity of CH_4 recovered from the nth anaerobic reactor, anaerobic lagoon, or anaerobic digester, as calculated in Equation II–4 of this section (metric tons CH_4).

CE = CH_4 collection efficiency of anaerobic process n, as specified in Table II–2 of this subpart (decimal).

(2) For each anaerobic digester, anaerobic reactor, or anaerobic lagoon from which some quantity of biogas is recovered, estimate the annual mass of CH_4 emitted using Equation II–6 of this section.

$$\mathrm{CH_4E}_n = \mathrm{CH_4L_n} + \mathrm{R_n}\left(1-\left(DE_1 * f_{Dest\_1}\right)\right) + \mathrm{R_n}\left(1-\left(DE_2 * f_{Dest\_2}\right)\right) \qquad \text{(Eq. II-6)}$$

Where:

CH_4E_n = Annual quantity of CH_4 emitted from the process n from which biogas is recovered (metric tons/yr).

n = Index for processes at the facility, used in Equation II–7.

CH_4L_n = Leakage at the anaerobic process n, as calculated in Equation II–5 of this section (metric tons CH_4).

R_n = Annual quantity of CH_4 recovered from the nth anaerobic reactor or anaerobic digester, as calculated in Equation II–4 of this section (metric tons CH_4).

DE_1 = Primary destruction device CH_4 destruction efficiency (lesser of manufacturer's specified destruction efficiency and 0.99). If the gas is transported off-site for destruction, use DE = 1.

$f_{Dest—1}$ = Fraction of hours the primary destruction device was operating (device operating hours/hours in the year). If the gas is transported off-site for destruction, use f_{Dest} = 1.

DE_2 = Back-up destruction device CH_4 destruction efficiency (lesser of manufacturer's specified destruction efficiency and 0.99).

$f_{Dest—2}$ = Fraction of hours the back-up destruction device was operating (device operating hours/hours in the year).

(e) Estimate the total mass of CH_4 emitted from all anaerobic processes from which biogas is not recovered (calculated in Eq. II–3) and all anaerobic processes from which some biogas is recovered (calculated in Equation II–6) using Equation II–7 of this section.

$$CH_4E_T = \sum_{n=1}^{j} CH_4E_n \qquad \text{(Eq. II-7)}$$

Where:

CH_4E_T = Annual mass CH_4 emitted from all anaerobic processes at the facility (metric tons).

n = Index for processes at the facility.

CH_4E_n = Annual mass of CH_4 emissions from process n (metric tons).

j = Total number of processes from which methane is emitted.